

DISCUSSION PAPER SERIES

No. 6698

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FINANCIAL ECONOMICS



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February 2008

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CEPR Discussion Paper No. 6698

February 2008

ABSTRACT

Voluntary Corporate Environmental Initiatives and Shareholder Wealth*

Researchers debate whether environmental investments reduce firm value or can actually improve financial performance. We provide some first evidence on shareholder wealth effects of *voluntary* corporate environmental initiatives. Companies announcing membership in Climate Leaders and Ceres - two voluntary environmental programs related to climate change - experience significantly negative abnormal stock returns. The price decline is smaller in carbon-intensive industries, where regulatory actions are more likely, and for high book-to-market firms, suggesting that "green" expenditures crowd out growth-related investments. We also document insignificant announcement returns for portfolios of industry rivals. Overall, the environmental investments appear to conflict with shareholder value-maximization. This has far reaching implications since the U.S. government relies on voluntary initiatives to reduce the emissions of greenhouse gases.

JEL Classification: G31, G38 and Q5

Keywords: capital expenditures, climate change, corporate social responsibility, environmentally responsible investing and shareholder wealth

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* The authors would like to thank Espen Eckbo for valuable comments and suggestions, and Hanna Breetz, Abe Holland, and Chetan Mehta for excellent research assistance. This research was supported by the Rockefeller Center at Dartmouth College and the Tuck School of Business at Dartmouth College.

Submitted 30 January 2008

1. Introduction

The board of directors has a fiduciary duty to shareholders. In this paper, we examine if environmentally responsible investments (ERI)—i.e. voluntary capital expenditure decisions aimed at reducing the pollution of the firm—and in particular investments related to climate change, conflict with this fiduciary duty. Corporate investments in environmental technologies have traditionally been considered a drain on a firm's resources, creating an inherent conflict between environmental and financial performance (e.g. Palmer et al, 1995; Walley and Whitehead, 1994). Heinkel, Kraus and Zechner (2001) show, however, that if a sufficiently large fraction of investors refuse to hold the stock of polluting firms, the price of these firms fall and their cost of capital rise. In equilibrium, firms whose increase in financing cost is large enough to offset the expenditures necessary to reduce pollution will optimally chose an environmentally responsible investment strategy.

More recently, it has been argued that corporate environmental responsibility can actually improve financial performance. The potential gains from ERI include a differentiation of product (increasing customer demand) by signaling that the company is “green”, a reduction of the risk of future environmental liabilities and lawsuits, and a cut in production costs associated with the pollution-reducing measures (Porter and van der Linde, 1995; Reinhardt, 1999). Moreover, ERI could spur governmental regulatory actions, giving the firm a competitive advantage once its industry rivals are forced to comply.

Several studies document a positive relationship between environmental performance and accounting profitability measures.¹ Furthermore, it appears that investments in portfolios of firms with above-average ratings for environmental responsibility earn positive risk-adjusted returns.² The positive correlation between environmental and financial performance, however, does not indicate causality: it is unclear whether ERI improve financial performance or if profitable companies are more likely to go green because they can afford the cost of doing it.

¹ Cormier, Magnan and Morard (1993), Hart and Ahuja (1996), Russo and Fouts (1997), King and Lenox (2001), Konar and Cohen (2001), and Telle (2006). Jaggi and Freedman (1992) and Mollow, Erekson, and Gorman (2002) find a mixed or negative relationship between environmental performance measures and accounting profitability.

² White (1996), Cohen, Fenn and Konar (1997), and Derwall et al. (2005). This is a subset of the literature studying the returns on funds focusing on socially responsible investing (SRI). See e.g. Geczy, Stambaugh and Levin (2005).

Nevertheless, studies of announcements of environmental violations or the required release of environmental performance data suggest that shareholders value good environmental performance: stock prices fall when firms report toxic release inventory figures, environmental crises, or process initiatives, and rise when firms receive environmental awards (Hamilton, 1995; Klassen and McLaughlin, 1996; White, 1996; Gilley et al.; 2000). Interestingly, Karpoff, Lott and Wehrly (2005) show that the market losses suffered by firms announcing violations of environmental regulations are of similar magnitudes as the legal penalties imposed, suggesting that the average firm suffers no reputational costs.

The pervasive use of environmental liability and toxic release data, however, limit the inferences of these studies to investments related to compliance. Climate initiatives, in contrast, originate from a starkly different regulatory context: most greenhouse gases (GHG) are currently not regulated by the U.S. Environmental Protection Agency (EPA). It is becoming common knowledge that it is socially optimal to reduce the overall emissions of greenhouse gases. Yet, the U.S. government relies on the assumption that the corporate gains from a reduction in greenhouse gas emissions are sufficiently large to induce widespread investments in the necessary technology.

This is the first study to examine how shareholders value corporate commitments to *voluntary* environmental programs, and in particular initiatives related to climate change. We estimate the cumulative abnormal stock returns (CAR) for a sample of firms announcing their voluntary participation in one of two programs that involve commitments to environmental standards: the EPA Climate Leaders (CL) and Ceres. Contrary to earlier results related to compliance, we find a negative and significant average CAR when firms announce that they join these programs. Specifically, firms becoming members in Climate Leaders experience an average stock price drop of -0.9%, whereas firms joining Ceres have insignificant CARs. Moreover, when firms—as part of the CL program—subsequently announce a specific goal for the reduction of their GHG gas emissions, their stock price declines further (-1.3% on average). In other words, the net effect of a commitment to join Climate Leaders and reduce greenhouse gas emissions is a decline in shareholder wealth. Thus, for the average firm in our sample, it does not pay to be green.

The announcement returns are less negative for firms in carbon-intensive industries, where future federal regulation of GHG emissions is most likely. That is, the marginal effect on firm value is less dramatic when the stock price already reflects a high probability that the firm at some future point have to make the capital expenditures necessary to reduce its use of fossil fuels. Moreover, the stock price drop is greater for firms with low book-to-market. Thus, green investments by a high growth firm signal that it is reallocating corporate resources away from its positive net present value projects or that the firm has fewer profitable investment opportunities than previously anticipated. We also find that the announcement returns are increasing in the oil price, reflecting a greater cost savings per unit reduction in the use of fossil fuels, and decreasing in the firm's historical environmental performance, suggesting that the reputational effects of green investment ("green goodwill") are greater for low-polluting firms.

We also analyze the valuation effect on the industry competitors of the sample firms. If the announcement spurs federal regulation of greenhouse gas emissions that will ultimately change the cost structure in the industry, we expect a negative rival stock price reaction. We find, however, insignificant announcement returns for portfolios of industry rival stocks. This is consistent with the notion that the average membership in Climate Leaders or Ceres does not materially affect the anticipated likelihood of future regulatory actions. Interestingly, the rival returns are decreasing in industry concentration, indicating that the expected industry-wide costs are lower when competition is relatively fierce. It is possible that the sample firms' environmental capital expenditures are limited by industry competitive pressures, thus reducing the competitive advantage of the firm would regulation eventually force rivals to make comparable investments.

Since firms self-select to join CL and Ceres, the coefficients in the cross-sectional regressions may be biased. To address this issue, we examine the probability that a firm joins Climate Leaders or Ceres, limiting our analysis to the industries represented by the sample firms. Importantly, the likelihood that a firm joins either of these programs decreases with the firm's corporate governance ratings and is greater in periods of intensive press coverage of climate change. Consistent with the notion that ERI conflict with shareholder interests, CEOs influenced by public concerns and with less shareholder oversight

are more likely to voluntarily undertake environmental initiatives. We further use a Heckman two-step procedure to correct the cross-sectional analysis for biases resulting from this self-selection. While the self-selection correction variable λ is significant in the regressions for the sample firm CARs, most of the regression results hold.

The paper is organized as follows. Section 2 provides a brief description of the CL and Ceres programs, the sampling procedure and characteristics of the sample firms. Section 3 describes our event study and reports the results from cross-sectional regressions of the announcements returns. The rival firm abnormal returns are analyzed in Section 4, while Section 5 examines the decision to join Climate Leaders and Ceres, and corrects the regression results for self-selection. Lastly, Section 6 offers some concluding remarks.

2. Sample Selection and Data Description

This study focuses on voluntary corporate environmental initiatives. We have chosen two programs where firms voluntarily commit to improve their environmental performance, and which both emphasize promotional opportunities of the green initiative as one of the main benefits to their members.

2.1 The Climate Leaders program and the Ceres Principles

The EPA Climate Leaders program is an industry-government partnership that works with companies to develop long-term strategies to reduce their impact on the climate. The CL corporate partners set aggressive 5-10 year goals for the reduction of greenhouse gases, and annually track and report their emissions to measure progress.³ In return, EPA provides technical assistance for the measurement and reporting of the firms' GHG emissions. The CL program, which started in 2002, requires its partners to conduct a careful inventory (quantity estimate) of their current GHG emissions before they commit to a specific reduction goal. The announcement of this goal usually follows within a year of the membership announcement. The goal is typically stated in percent reduction of total emissions, percent reduction of emissions

³ The Climate Leaders program focuses on the six major greenhouse gases: CO₂, CH₄, N₂O, HFCs, PFCs, and SF₆.

per unit of output (KWh, dollar of revenue, production unit, tons produced, etc.), or a “net zero” goal. The latter implies that instead of decreasing its own pollution, the company pays for the reduction of another company’s pollution or offsets its own pollution by planting trees or sponsoring clean energy projects, so called “offset projects”.⁴

Ceres is a national network of environmental organizations and other public interest groups that works with companies and investors to address sustainability challenges, such as global climate change. The Ceres Principles is a ten-point code of corporate environmental conduct, dated 1989, that is publicly endorsed by companies as an environmental mission statement. Firms adopting the Ceres Principles pledge their dedication to environmental awareness and accountability, and commit to active continuous improvement, dialogue and systematic public reporting on their environmental progress. The Ceres Principles include reduction of pollution and waste, sustainable use of natural resources, energy conservation, and environmental restoration, as well as a commitment to inform the public and conduct a yearly self-evaluation of the progress in implementing the principles. Ceres provides advice on reporting and incident response, and helps communicate the company’s environmental commitment to investors and the broader public. To enhance corporate accountability, the Ceres companies annually publish information on their environmental progress in corporate sustainability reports.⁵

2.2 Sample selection

There are 139 firms in the CL program and 72 firms in the Ceres program by June 2007. We identify another 3 companies that have left the CL program, for a total of 214 firms. We eliminate 57 firms that are privately held or listed outside the US, for a total sample of 157 US publicly traded firms. Searching Factiva and Lexis-Nexis Environmental for articles and press releases announcing that the company joins CL or Ceres, we are able to identify an exact announcement date for 113 of these firms. The news search in Factiva and Lexis-Nexis also yields a date for the announcement of the GHG reduction goal for 70 firms, for a total of 183 announcements.

⁴ Companies like the Carbon Fund and TerraPass specialize in arranging offset projects for greenhouse gases.

⁵ For more information on CL and Ceres, see <http://www.epa.gov/stateply/index.html> and <http://www.ceres.org>.

We next search Factiva, Lexis-Nexis Academic and Google Finance on the day of the announcement and the surrounding days for articles and press releases with competing news that could potentially impact the stock price. This search eliminates 54 cases due to the concomitant release of information on earnings, credit downgrades and other major corporate news. Finally, since stock return data in the Center for Research in Securities Prices (CRSP) database is available through the end of 2006 only, we eliminate 17 cases in 2007 for a total sample of 85 announcements over the period 1993-2006. Table 1 reports the distribution of the announcements over time and across the different programs. As shown in the table, the sample consists of 46 firms joining the Climate Leaders program and 18 firms joining the Ceres program. Moreover, there are 21 firms announcing their goal for the reduction of greenhouse gas emissions, of which five are also in the Climate Leaders sample (but with different announcement dates). Most of the Ceres announcements take place in the 1990s or towards the end of the sample period, while the CL and GHG announcements are relatively evenly distributed between 2002 and 2006.

2.3 Sample characteristics

Table 2 presents financial and industry characteristics of the sample firms. We identify a total of 2,787 industry rivals from CRSP, defined as all firms with the same 4-digit SIC code as the sample firm in the year of the announcement. Notice first that the sample firms are very large when compared to other publicly traded firms in their industry. The average market value of equity six trading days prior to the announcement is \$30 billion (median \$10 billion) and total sales (from Compustat) average \$22 billion (median \$11 billion) in the year prior to the announcement. Moreover, 92% (94%) of the sample firms have a market value (total sales) exceeding the median rival firm in its industry. The average book-to-market ratio is 0.38 (median 0.36). The sample firms have slightly higher growth options than their industry rivals, with one third of the firms having a book-to-market above the industry median. Only 12% of the sample firms are traded on NASDAQ (versus the NYSE or Amex), another manifestation of the large size of firms joining Ceres and Climate Leaders.

Companies joining Climate Leaders and setting greenhouse gas goals are substantially larger than the firms in Ceres: the average market value of the CL firms is \$33 billion (median \$11 billion) compared to \$11 billion (median \$2 billion) for the Ceres firms. Moreover, almost all companies in Climate Leaders (98%) have a market value exceeding their median industry rival, while two-thirds of the Ceres firms are larger than the industry median. The Ceres firms further have a higher average book-to-market ratio than the firms in the CL and GHG groups. The proportion of firms listed on NASDAQ, however, is similar across the three subsamples.

Table 2 also shows the number of rivals and the degree of industry concentration, indicating the level of competition in the industry. For our rival analysis, we construct portfolios of rival firms in the same 4-digit SIC code as the announcing firm. There are on average 38 rival firms in each industry portfolio, with a median of 20 firms. Industry concentration is measured using the Herfindahl index, $HI = \sum_n (s_i / \sum_n s_i)^2$, where s_i is the total sales of firm i , and $i = [1, n]$ is an index of all firms in the industry. The average Herfindahl index is 0.26, with a median of 0.16. Firms stating GHG goals are in the least concentrated (or most competitive) industries, with an average Herfindahl index of 0.18 (median 0.10). Finally, a majority of the sample firms (60%) are in the manufacturing industry, 22% in the transportation industry, and 9% in the finance industry, with the remaining 9% distributed across other industries. The proportion of firms in manufacturing is highest for the CL program (67%) and lowest for Ceres (44%), with a greater fraction of Ceres firms in transportation and finance.

2.4 Environmental performance

The degree to which firms rely on energy as an input in the production process varies across industries. We classify industries based on their overall use of fossil fuels, applying criteria from the Carbon Disclosure Project.⁶ Two-thirds of the sample firms (63%) are in industries with carbon-intensive production. Not surprisingly, the fraction of firms in carbon-intensive industries is lower for Ceres than for firms an-

⁶ The Carbon Disclosure Project (CDP) could be of interest to a study of voluntary initiatives like ours. We do not use the CDP announcements, however, since they all occurred in 2007. See <http://www.cdproject.net/index.asp>.

nouncing a goal for the reduction of greenhouse gases (50% versus 76%), reflecting the lower proportion of manufacturing firms joining Ceres.

We also gather data on the firms' emissions of greenhouse gases from the Carbon Disclosure Project and sustainability reports. The average firm in the sample emits 18.4 million (median 2.7) metric tons of carbon dioxide (CO₂) equivalents in the year prior to the announcement. The firms joining Ceres have lower average emissions of greenhouse gases than the Climate Leaders firms. While not shown in the table, this is because the CL and GHG categories include firm outliers with much higher emissions: the highest emissions in Climate Leaders is 169.6 million metric tons CO₂ equivalents (by American Electric Power in 2002) compared to a maximum value of 24.2 metric tons in Ceres. Moreover, we are able to find information on the initial goal for the reduction of greenhouse gas emissions for 18 of the 21 firms in the GHG sample. The average goal is a 17% reduction of greenhouse gases (median 15%), with the smallest goal being a 4% emission reduction. The most aggressive goal is set by United Technologies Corporation, who initially pledged to reduce its greenhouse gas emissions by 46% per dollar revenue over a five-year period. None of the sample firms have a net-zero goal, involving the purchase of offset projects.

KLD Research and Analytics, Inc. provides yearly assessments of company environmental performance in their product KLD STATS. We use KLD STATS to gauge the environmental performance of the sample firms in the year prior to the announcement. KLD rates companies with a one (if present) or zero (if absent) in six areas of environmental strengths and concerns, respectively. Environmental strengths include revenues from environmental services, programs for pollution prevention, and the use of recycled materials; while environmental concerns include liabilities for hazardous waste sites, violations of environmental regulations, manufacturing of ozone depleting and agricultural chemicals, and the emissions of toxic chemicals. As shown in Table 3, we focus on four performance measures: the number of strengths; the number of concerns; the total score defined as the number of strengths minus the number of concerns; and the net score in the "climate" category. The climate score is the difference between the score in the "Clean Energy" strength category—an indicator that the firm has taken substantial measures

to reduce its impact on climate change and air pollution—and the score for the “Climate Change” concern category—an indicator that a substantial fraction of the firm’s revenues is derived from the sale of coal, oil, or derivatives thereof. We are able to identify KLD records for 66 sample firms and 1,110 of their industry rivals.

The total score averages -0.26 across the full sample. That is, the average firm ranks somewhat lower on its environmental strengths than its concerns (0.71 versus 0.97). The individual scores range from -3 to +3, with negative ratings for 25 firms (38%), positive ratings for 20 firms (30%) and a net score of zero for the remaining 21 firms. The companies in Ceres have a better overall pre-announcement environmental standing than firms in Climate Leaders, with a mean score of 0.08 versus -0.40 for the CL firms. Moreover, 90% of the Ceres firms have a total score at par with or higher than their average industry rival.

Interestingly, the sample firms rate significantly higher than their competitors on environmental strengths. The highest average number of strengths (0.95) is associated with firms declaring a greenhouse gas reduction goal. There is no discernible difference between the sample firms and their rivals on the two remaining scores: environmental concerns and the climate score. The Ceres firms, however, have on average fewer concerns (as well as a better climate score) than firms in the Climate Leaders program, reflected in their higher total score. Overall, the sample firms have an environmental performance at par with or better than their average industry competitor in the year prior to the event.

3. Shareholder Wealth Effects

Why do firms sign up for environmental initiatives like Climate Leaders and Ceres? A company may adopt a strategy for the reduction of greenhouse gas emissions without joining the Climate Leaders program. Similarly, high environmental standards could be applied without an official endorsement of the Ceres Principles. The public pledge to a reputable program could, however, help reduce information asymmetries with company outsiders—investors and customers—about the firm’s environmental performance and commitment to ERI. This might be valuable if customer preferences are biased in favor of en-

vironmentally friendly suppliers, improving the firm's competitive position. It could also increase firm value by credibly conveying information about reductions in future energy and production costs, or in future environmental liabilities. On the other hand, if the expected costs of the necessary environmental investments and enhanced accountability exceed the potential benefits, the initiative reduces firm value. In this case the decision to go green conflicts with directors' fiduciary duty to maximize shareholder wealth.

3.1 Announcement abnormal returns

To examine the valuation effect of voluntary corporate environmental programs, we estimate the abnormal announcement stock returns for the firms in our sample. Focusing on the day that the new information reaches the market, announcement returns provide a natural experiment for asking how the stock market values the news about the environmental initiatives. In particular, investors immediately incorporate in the stock price the net present value of all future expected cash flows associated with the investments (costs and revenues). The narrowing of the window to the announcement day plus and minus one or two days increases the power of the tests compared to measuring returns over long windows where all daily returns enter with equal weight.

The abnormal return for firm j on day t is estimated as $AR_{jt} = R_{jt} - (\hat{\alpha}_j + \hat{\beta}_j R_{mt})$, where R_{jt} is the return of the stock of firm j on day t ; R_{mt} is the market return on day t ; and $\hat{\alpha}_j$ and $\hat{\beta}_j$ are the coefficients estimated from the single-factor market model $R_{jt} = \alpha_j + \beta_j R_{mt} + \epsilon_{jt}$ over days -256 through -6. We require a minimum of 100 return observations in the estimation of the market model. The cumulative abnormal return for firm j over the event window day -1 to +1 is $CAR_{-1,1} = \sum_{t=-1}^1 AR_{jt}$; and the average cumulative abnormal return across the N sample firms is $ACAR_{-1,1} = \frac{1}{N} \sum_{j=1}^N \sum_{t=-1}^1 AR_{jt}$.

Panel A of Table 4 shows average cumulative abnormal returns for the sample firms, estimated with an equal-weighted market index, and where 0 is the announcement day. We include two days prior to the announcement to capture any effects of information leakage as well as the following two days to include effects of announcements made after market closing and a gradual update of the stock price. Inte-

restingly, the average abnormal announcement return across the full sample is -0.68% and highly significant for the window -1 to +1. That is, companies announcing a commitment to CL, Ceres or GHG tend to experience a drop in their stock price. This price decline is greatest for firms stating a specific goal for the reduction of greenhouse gases ($ACAR_{-1,1} = -1.30\%$) and firms becoming a partner of the Climate Leaders program ($ACAR_{-1,1} = -0.89\%$). The announcement return is, however, indistinguishable from zero for firms endorsing the Ceres Principles. The stock price decline is even greater over the -2 to +2 window, with a mean $ACAR_{-2,2}$ of -1.2% across the full sample, and -1.5% and -1.6% for the firms in CL and GHG, respectively. These results are confirmed by the generally low proportion of positive to negative returns, and hold in estimations using a value-weighted index shown in Panel B of Table 4. Thus, there is convincing evidence that shareholder value declines when firms announcement their membership in Climate Leaders and Ceres, and again when a specific greenhouse goal is announced.

3.2 Cross-sectional determinants of the announcement returns

The univariate analysis in Table 4 above suggests that investors are indifferent to broader environmental initiatives like Ceres, but penalize companies for carbon-specific commitments like the Climate Leaders program. We next turn to an examination of the determinants of the cross-sectional variation in the announcement returns. A decrease in the greenhouse gas emissions generally requires a reduction in the use of fossil fuels. The higher the relative price of fossil fuels, the greater is the value of a given increase in energy efficiency. The price of fossil fuels, such as oil, varies considerably over the sample period. As shown in Figure 1, the U.S. domestic crude oil price hovered around \$10 to \$20 per barrel in the 1990s, to take off and reach record high levels in recent years. To capture variations in energy costs, the explanatory variables include the average crude oil price over a three-month period ending the month prior to the announcement.⁷

Federal regulations of greenhouse gas emissions will most likely target industries that depend heavily on fossil fuels. If the pre-announcement stock price already reflects the higher probability of regu-

⁷ Crude oil prices are from the Monthly Energy Review of the U.S. Department of Energy/Energy Information Administration, available at <http://www.eia.doe.gov/emeu/mer/petro.html>.

latory actions, the announcement of the environmental commitment should have a smaller impact on firm value. To control for this, the regressions contain an indicator for carbon-intensive industries.

Moreover, the preferences of customers and managers for ERI may have changed over time. Figure 2 plots the monthly frequency of U.S. press hits for keywords related to climate change and corporate social responsibility over the period 1990-2007. The black line represents the number of articles containing “climate leader”, “climate change”, or “global warming” while the grey line represents the number of articles containing the words “Ceres” and “corporate social responsibility”. The figure shows how the public interest for global warming has skyrocketed in 2005-2006. The general awareness of corporate social responsibility has a similar development, but of a much smaller magnitude. We include the total number of press hits related to climate change (black line) over the 12 months ending in the month prior to the announcement to represent society’s preferences for a greener production.

For firms announcing a greenhouse gas goal, we also include their goal stated in percent reduction. Aggressive GHG reductions require higher capital expenditures and may therefore imply greater total costs. The regressions further contain firm characteristics such as size (market capitalization on day - 6 in \$ billions) and book-to-market value (from Compustat, using the December closing price in the year prior to the announcement). Moreover, it is possible that the extent of environmental investments is limited by industry competition. If competitive industry pressures prevent firms from undertaking huge environmental capital expenditures, investors should be more concerned with the ERI of companies in concentrated industries. The Herfindahl index described above is used as a proxy for the degree of industry competition. We also include three KLD measures for the firm’s environmental performance in the year prior to the announcement: total strengths, total concerns, and the climate score.

Table 5 reports the coefficient estimates from weighted least square (WLS) regressions of the percent cumulative abnormal announcement return $CAR_{1,1}$. The total sample comprises 58 firms with available industry rival data from Compustat and KLD records. The first three columns use the full sample, while in the fourth column the sample is limited to firms announcing their membership in Climate Leaders or a goal for greenhouse gas reduction. In addition to the variables discussed above, the regres-

sions contain indicators for CL firms and GHG firms, as well as fixed effects for the industries manufacturing, finance and transportation. The regressions are highly significant with an adjusted R^2 ranging from 35% to 43%.

There are several interesting results. As expected, the announcement returns increase with the crude oil price. That is, programs diminishing the dependence on fossil fuels have a greater value when energy prices are high, reducing the expected net loss from the investment. Moreover, the coefficient for carbon-intensive industries is positive and significant, as predicted. Since future regulation of greenhouse gas emissions is more likely for carbon-intensive industries, the expected costs for the environmental investments are partially reflected in the pre-announcement stock price of these firms. The variable for the press coverage of climate change produces a significantly negative coefficient. Thus, the stock price decline is greater in periods of high public awareness of climate change. In other words, the costs associated with Climate Leaders and Ceres are higher for the firms voluntarily committing to these initiatives in recent years. This suggests that an intensified public concern with global warming increases the pressure on CEOs to invest in environmentally friendly technologies, also when shareholder losses are substantial. We'll return to this supposition in Section 5 below when examining the characteristics of firms that chose to join these programs.

Moreover, firms with higher book-to-market values, or lower growth options, experience a smaller decline in their stock price.⁸ It is possible that the environmental capital expenditures crowd out investments in positive net present value projects for firms with high growth options, causing a greater loss of value. Alternatively, the environmental investments signal that the firm has fewer positive net present value projects than previously anticipated by investors (see e.g. McConnell and Muscarella), having more serious implications for the valuation of firms with a large fraction of their value attributable to growth options.

⁸ In contrast, stock returns are found to decrease with the book-to-market ratio for corporate announcements of R&D expenditures. See e.g. Szewczyk, Tsetsekos, and Zantout (1996).

The announcement CARs are further decreasing in the degree of industry concentration, as predicted. The result that firms in concentrated industries tend to exhibit the largest losses indicates that environmental investments are limited by industry competitive pressures. Moreover, as documented in Table 4 above, the announcement returns are significantly lower for firms joining the Climate Leaders program or pledging a greenhouse gas reduction goal than for firms endorsing the Ceres Principles. Also as expected, the coefficient for the percentage goal in greenhouse gas emissions is negative and significant. The more aggressive the goal is, the more capital expenditures will be required, and the greater the expected loss of shareholder value.⁹

Of the environmental performance variables, only the number of environmental concerns produces a significant coefficient. Specifically, the announcement returns are more negative for firms with a history of poor environmental performance. This is consistent with Clarkson and Li (2004), who show that environmental capital expenditures have a more negative impact on the total market capitalization of high-polluting firms compared to low-polluting firms. They conjecture that this is because the high-polluting firms will not be credited with “green goodwill” to the same extent as the low-polluting firms.

3.3 Changes in environmental rankings

One cannot rule out that investors value green investments in general but penalize the sample firms because they don't anticipate an improvement in the companies' environmental performance. Although a coarse measure, we examine the change in environmental performance as assessed by KLD. Table 6 shows the change in the environmental rankings from the year prior to the event (-1) to the year following the event (+1). Since there are no rankings available for 2007, the sample is reduced to 46 announcements in 2005 or earlier. The changes in the overall score range from -2 to +2, with an average of 0.20. The highest average increase in the total score of 0.50 is reported for the Ceres firms.

⁹ While not shown in the table, we include in alternative specifications the firm's level of greenhouse gas emissions (in metric tons) in the prior year. Limiting the regression to a smaller set of firms for which this variable is available, it does not produce a significant coefficient.

All sample firms experience a non-negative change in the number of environmental strengths. The average increase in the score for strengths is 0.37 and significant at the 1%-level. The number of environmental concerns, however, grows as well, but with a somewhat lower mean of 0.17. Only the Ceres firms have a non-positive change in their score for environmental concerns. Finally, the average climate change score increases with a significant 0.21. This increase is entirely attributable to firms joining the Climate Leaders program or announcing a greenhouse gas reduction goal. Overall, the negative stock price reaction to the voluntary environmental initiatives is followed by an average increase in environmental performance. Thus, the benefits of the performance increase itself, if any, are insufficient to balance the costs of the programs.

We test this relationship further by exploring the cross-sectional determinants of the changes in environmental rankings from year -1 to +1. The explanatory variables are the same as in Table 5 above. To examine if the stock market reaction reflects an anticipation of the subsequent ranking change, we further add as an independent variable the abnormal announcement returns $CAR_{1,1}$. The coefficient estimates from the OLS regressions are reported in Table 7. The dependent variable in the first two columns is the change in the total score, while the dependent variables in the third and fourth columns are the change in the number of strengths and concerns, respectively.

The regressions for the change in the total score are significant with an adjusted R^2 of 0.27 and 0.28, respectively. Similar to the results for the abnormal announcement returns, the change in environmental rankings is increasing in the crude oil price and declining in the intensity of the press coverage of climate change. This supports our earlier interpretation that ERI is a more attractive strategy in periods of high energy costs and that firms undertake these initiatives in recent years despite greater net costs, for example in the form of smaller performance improvements. The change in the environmental score is also positively correlated to industry concentration, perhaps because industry competition limits the firm's ability to invest in environmental technologies, consistent with the evidence in Table 5 above.

The environmental rankings change is further declining in the firm's pre-announcement environmental score and book-to-market ratio. That is, firms with a history of low environmental performance

and high growth options tend to experience a greater increase in their environmental score. Finally, the coefficient for the announcement return $CAR_{-1,1}$ is insignificant, indicating that the stock market reaction to the announcement is largely a poor predictor of the subsequent change in the firm's environmental performance score. One interpretation is that the environmental investments on average have little reputational value, consistent with the evidence in Karpoff, Lott and Wehrly (2005). As shown in the last two columns, the same variables generally explain the change in environmental concerns, although with the opposite sign, while the regression for the change in environmental strengths has low explanatory power.

4. Wealth Effects for Rival Firms

Investors react negatively when the firm announces its membership in the Climate Leaders program and again on the announcement of its goal for GHG reduction. The valuation impact on its industry rivals is, however, uncertain. The announcement may simply convey information about a poor investment decision made by the firm, having little or even a positive effect on the valuation of industry competitors. Alternatively, a voluntary commitment to CL or Ceres could spur governmental regulations, increasing the likelihood of industry-wide changes in the cost structure, with negative valuation implications for all firms in the industry.¹⁰

4.1 Average abnormal announcement returns for rival portfolios

To address this issue, we form equal-weighted portfolios of all industry rivals for each sample firm and estimate the rival portfolio abnormal returns AR_{jt} as described above. The abnormal return estimates for the industry rivals are reported in Table 8. Panel A presents estimates using an equal-weighted market index, while Panel B contains estimates using a value-weighted index. The average cumulative abnormal stock returns for the rival portfolios are generally insignificant from zero, for both the window of -1 to +1 as well as the longer window of -2 to +2. Moreover, this result holds using either an equal-weighted or a value-weighted index.

¹⁰ Industry rivals are affected by new information concerning the industry cost structure, customer demand, etc. See e.g. Jarrell and Peltzman (1985) for evidence that competitors of auto and drug companies announcing product recalls suffer significant stock price declines (as do the firms themselves).

Using the equal-weighted index, the sign ratio provides some inconclusive evidence suggesting that most firms experience a negative stock price reaction to the announcement. Over the -1 to +1 window, a total of 51 rival portfolios decline in value while only 27 portfolios experience a value increase, significant at the 1%-level. Although negative, the magnitude of this reaction is however very small. Overall, the insignificant stock price reaction for rival firms suggests that the average membership in Climate Leaders or Ceres does not materially increase the anticipated likelihood of future environmental regulations, nor does it appear to provide a competitive advantage to the sample firm over its rivals.

4.2 Variation in the rival portfolios returns

Table 9 present the results from cross-sectional regressions for the variation in the announcement returns of the competitors. The dependent variable is the rival portfolio CARs from day -1 to +1, estimated using an equal-weighted market index. The regressions are estimated using WLS and contain largely the same independent variables as the regressions in Table 5 above. We also include measures for the average environmental performance (total strengths, total concerns, and climate) across each industry rival portfolio in the year prior to the announcement. The first two columns of Table 9 use a sample of 51 rival portfolios with Compustat and KLD data for the industry firms, while the last two columns exclude the Ceres announcements for a sample of 44.

The regressions using the full sample are significant with an adjusted R^2 around 20%. Interestingly, the stock returns are significantly lower for rivals of firms joining Climate Leaders and declaring greenhouse gas goals than for rivals of firms endorsing the Ceres Principles. This suggests that announcements related to the Climate Leaders program are more likely to spur governmental regulations, which will ultimately force competitors to make comparable investments. Moreover, the Herfindahl industry concentration measure produces a negative coefficient, implying that rivals in concentrated industries experience a greater loss in value. If industry competitive pressure limits the firm's environmental capital expenditures, it may also limit the firm's competitive advantage would regulation later coerce competitors to comply.

The environmental rankings affect the return on the industry portfolios in several ways. First, the rival portfolio CARs are increasing in the environmental performance of the industry: the rival average environmental strengths receives a positive coefficient and, when excluding industry fixed effects, the rival average environmental concerns produces a negative coefficient. It is possible that the expected costs from regulation are lower in industries with relatively strong environmental performance because future regulation is less likely to be binding for low-polluting firms. The rival returns are further declining in the climate score of the sample firm. Recall from Table 5 above that the announcement abnormal returns of the sample firms are increasing in their past environmental performance, perhaps because environmental investments have lower reputational value for less-polluting firms. To the extent that a higher climate score can help leverage the green goodwill from the environmental initiative, this creates a competitive disadvantage for the firm's rivals. Lastly, the competitor CARs increase with the prior environmental strengths of the sample firm. This result is surprising and suggests that any potential reputational benefits are limited to the performance score related to climate change.¹¹ All these results generally hold for the subsample of firms joining Climate Leaders and declaring a greenhouse goal target.

5. The Voluntary Nature of Environmental Initiatives

A caveat with the above analysis is that firms joining environmental programs voluntarily self-select to do so. One cannot preclude the notion that the announcement of the initiative reveals some other information about the firm. The event could thus be correlated with negative information, without necessarily implying that the environmental investment is value reducing in itself. Table 10 lists the 30 firms joining Climate Leaders and Ceres with the most negative announcement return. As discussed in Section 2 above, these are very large and mostly well-known companies, such as Pfizer, Unilever, Lucent, Citigroup, Johnson & Johnson, DuPont, Oracle, ITT Corp., etc. Although not impossible, it seems unlikely that the announcement of joining Ceres or Climate Leaders signals much else than the environmental commitment

¹¹ In alternative specifications, not shown here, we replace the firm's environmental performance with a dummy indicating that the firm's environmental performance is better than the average in its industry. This variable also has a positive and significant impact on the rival portfolio returns.

itself. Notice also that two of the Climate Leaders partners (Polaroid and Norm Thompson) that were acquired by private investors left the program after going private. This anecdotal evidence supports the notion that voluntary environmental initiatives are detrimental to shareholder value maximization.

5.1 The decision to join Climate Leaders and Ceres

Table 11 reports logit estimations of the firm's choice to join Climate Leaders or Ceres. We limit the analysis to companies in the same 4-digit industries and years as the sample firms. The sample is 79 firms in the CL and Ceres programs as well as 762 unique contemporary industry rivals with available Compustat and KLD data.¹² The first two columns examine the choice of joining either program, while the third column singles out firms joining CL and the last column focuses on the decision to join Ceres.

In addition to the variables used before, we include a dummy indicating whether or not the firm is listed on NASDAQ (versus NYSE or Amex), as well as KLD's score on the firm's corporate governance strengths and concerns. The corporate governance strengths include low levels of top management compensation, effective reporting on social and environmental performance, leadership in public policy issues, and a positive corporate culture. The corporate governance concerns involve issues like high level of board and top management compensation, accounting related controversies, weak reporting, and little public policy involvement and accountability. If managers undertake value-reducing environmental investments for reasons of social responsibility, such commitments should be more common among firms with poor corporate governance standards.

The regressions are significant with a pseudo R^2 (Cox & Snell) around 15%. Interestingly, the probability of joining Climate Leaders and Ceres increases with the press coverage of climate change and the score for corporate governance concerns. In other words, CEOs influenced by widespread public concerns with global warming and with less shareholder oversight are more likely to pledge corporate resources to environmental investments. Combined with the earlier evidence of negative announcement re-

¹² The sample includes 21 firms announcing a greenhouse gas goal that are excluded from the CL sample above because their announcement to join the Climate Leaders program is corrupted by concurrent news, or we are unable to exactly determine this date.

turns, this indicates that voluntary environmental commitments indeed reflect a conflict of interest with shareholder interests. Moreover, the coefficient for prior environmental strengths is positive and significant. That is, the firms in CL and Ceres have already committed substantial resources to their environmental performance prior to these programs, consistent with the notion that management has a particular interest in ERI. Firms joining Ceres further tend to rank relatively high on their climate score.

Surprisingly, the likelihood of joining these programs decreases with the oil price and is lower for firms in carbon-intensive industries, which have the highest dependence on fossil fuels. In other words, companies seem to ignore the potential for cost savings from a reduction of greenhouse gas emissions in their decision to join Climate Leaders or Ceres. Again, this supports the view that considerations other than shareholder wealth, like social responsibility, motivates management to voluntarily make a commitment to CL and Ceres. Lastly, the coefficient for NASDAQ is negative and significant, consistent with the univariate results in Table 2 above that the sample firms are typically of a greater size than their industry rivals. It is possible that the larger firms have more widely spread share ownership and therefore an inherently greater conflict of interest between management and the owners of the firm.

5.2 Correction for self-selection

Since the decision to join Climate Leaders or Ceres is voluntary, the coefficient estimates in the cross-sectional analysis of the announcement abnormal stock returns may be biased. We use a Heckman two-step procedure to correct for such self-selection (Heckman, 1979; Maddala, 1983). Let γZ be the firm's choice model, where the firm joins CL or Ceres if $\gamma'Z \leq \epsilon$ and ϵ is a mean zero error term with $Var(\epsilon) = 1$. We estimate the abnormal returns as $CAR_{-1,1} = \beta'X + u$ for $\gamma'Z \leq \epsilon$, where u is correlated with ϵ . Due to this correlation, $E(u|\epsilon \leq \gamma'Z) \neq 0$. The standard procedure to get unbiased estimates is to include the inverse Mills ratio from the choice model $\gamma'Z$ as an additional explanatory variable in the return regression.

We use the variables Z listed in the first column in Table 11 as our selection model, and where the coefficients γ are estimated using probit. Define the inverse Mills ratio λ such that $\lambda = \varphi/\Phi$, where

$\varphi(\gamma'Z)$ and $\Phi(\gamma'Z)$ are the standard normal density and cumulative distribution functions, respectively, evaluated at the predicted value $\hat{\gamma}'Z$. If the coefficient for λ is statistically significant, the coefficient estimates in Table 5 above are biased. The results are shown in Table 12. The dependent variable is the sample firm announcement returns in the first column, the change in environmental rankings in the second column, and the rival portfolio announcement returns in the third column. The regressions are estimated using WLS to correct for heteroscedasticity and includes the correction term λ for self-selection.

The Inverse Mills Ratio is significant in the first regression, indicating that the coefficient estimates in Table 5 are biased with respect to the choice of undertaking the environmental initiative. Importantly, several of the results hold when correcting for self-selection. The announcement CARs are still higher for carbon-intensive firms and lower for the companies joining Climate Leaders. Moreover, the returns are increasing in the firm's book-to-market ratio and prior environmental performance. However, the coefficients for climate change press hits, the size of the greenhouse gas reduction goal, and the Herfindahl index are no longer significant. For the two remaining regressions in Table 12, the inverse Mills ratio is insignificant, suggesting that neither the regressions for the change in environmental rankings nor the regressions for the rival abnormal returns are biased by the firm's decision to join Climate Leaders or Ceres.

6. Conclusions

Climate change may prove to be one of the gravest environmental challenges of this century. U.S. emissions and climate policy are of central importance to this issue, as the U.S. accounts for one quarter of global greenhouse gas emissions. However, efforts to limit U.S. emissions through international treaties, such as the Kyoto Protocol, or through federal regulations have routinely been defeated. The current U.S. climate policy relies entirely on voluntary emissions reductions programs, such as the EPA Climate Leaders and, to a lesser degree, Ceres—both corporate programs related to climate change. The success of voluntary programs depends on their ability to achieve meaningful company participation. Corporate partic-

ipation will ultimately depend on the payoffs to shareholders. Thus, it is crucial to examine the market response to such initiatives and determine if it pays for companies to be green.

Our study is the first to rigorously address this question with respect to climate initiatives. Previous studies generally show a positive relationship between environmental programs related to compliance and financial performance. However, difficulties with causality and environmental performance indicators such as the release of toxic inventory and environmental violations limit the inferences of these results to voluntary corporate environmental initiatives. We document significant losses in the market value of firms announcing that they join Climate Leaders or Ceres, or announce a goal for the reduction of greenhouse gas emissions as part of the Climate Leaders program.

The stock price decline is smaller for firms in carbon-intensive industries where future regulation is more likely, probably because the pre-announcement share price already reflects some of the expected costs of the necessary environmental investments. Moreover, the price drop increases in the firm's book-to-market ratio and prior environmental performance, indicating that green investments send a negative signal about the investment opportunity set for high growth firms and that the value of green goodwill is lower for polluting firms. These results hold when we correct for the self-selection of the sample firms. The announcements further have no statistically significant valuation effects on portfolios of industry rival firms, suggesting that the expectation of future regulation is unaffected by more firms signing up for Climate Leaders or Ceres.

Our finding of a negative market response has important implications for the success of voluntary emissions programs and potentially for the need to regulate GHG emissions. Importantly, the results indicate that environmentally responsible investments conflict with shareholder interests. Indeed, the firms joining Climate Leaders and Ceres are characterized by relatively poor corporate governance standards and CEOs are more inclined to sign up in periods of widespread public concerns with climate change. Our evidence indicates that the social costs of global warming are not internalized by corporations. As a result, federal regulation may prove to be the only viable way to achieve a broad reduction of greenhouse gas emissions in the U.S.

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Figure 1: U.S. domestic crude oil price, 1990-2007

The graph shows the development of the crude oil price in \$ per barrel, 1990-2007. The price is the domestic first price from the U.S. Department of Energy/Energy Information Administration's Monthly Energy Review.

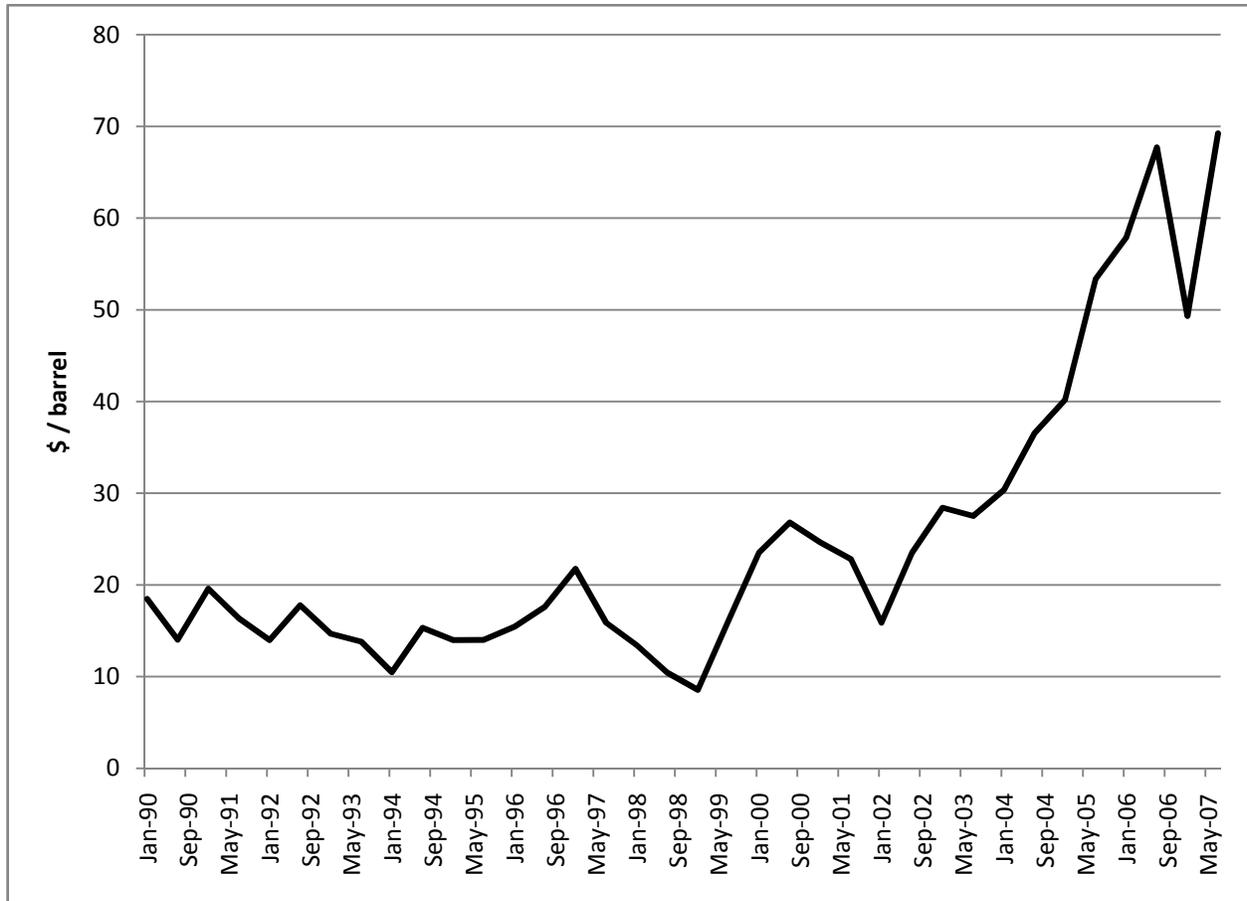


Figure 2: Frequency of U.S. articles on climate change and corporate social responsibility

The graph shows the monthly number of US press hits in Factiva for the words “climate leader”, “climate change”, or “global warming” (black line) and the words “Ceres” or “corporate social responsibility” (grey line), 1990-2007.

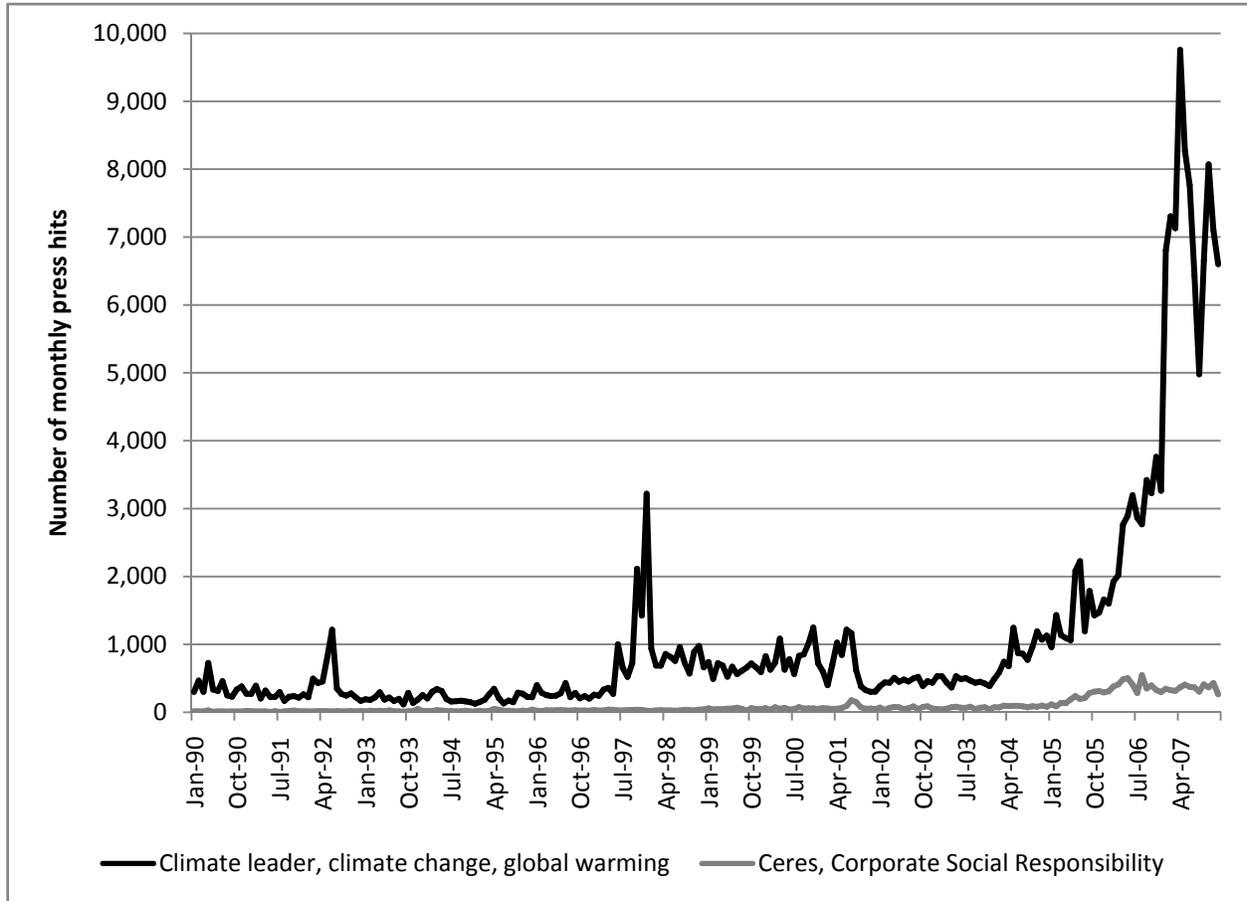


Table 1: Distribution of cases over time and events

CL represents firms joining the EPA Climate Leaders program, GHG represents firms in the Climate Leaders program announcing its goal for greenhouse gas reduction, and Ceres represents firms endorsing the Ceres Principles.

Announcement year	All firms	CL	GHG goal	Ceres
1993	2	0	0	2
1994	2	0	0	2
1997	3	0	0	3
1998	1	0	0	1
1999	1	0	0	1
2000	1	0	0	1
2001	1	0	0	1
2002	18	17	1	0
2003	13	8	5	0
2004	11	5	6	0
2005	6	1	4	1
2006	26	15	5	6
Total	85	46	21	18

Table 2: Financial and industry characteristics of the sample firms

CL represents the 46 firms that have joined the EPA Climate Leaders program, GHG represents the 21 Climate Leaders firms that have announced a greenhouse gas reduction goal, and Ceres represents the 18 firms that have endorsed the Ceres Principles, 1993-2006. The market value of equity is obtained from CRSP 6 trading days prior to the announcement. Industry rivals are all firms in CRSP with the same 4-digit SIC code as the sample firm in the announcement year. Total sales is obtained from Compustat in the year prior to the announcement. The Herfindahl index is defined as $\sum_n (s_i / \sum_n s_i)^2$, where s_i is total sales for firm i and $i = \{1, n\}$ is an index of all firms in the industry. ** (*) indicates that the sample firms are significantly different from the industry median at the 1% (5%) level, using a Wilcoxon signed ranks test.

	All firms	CL	GHG	Ceres
Market value of equity (\$ billion)				
Mean	30.4	33.0	41.7	10.8
Median	10.4	11.2	14.5	2.5
Fraction of firms with market value > industry median	0.92**	0.98**	1.00**	0.69**
Total sales (\$ billion)				
Mean	22.1	27.1	22.9	8.6
Median	11.1	12.1	14.5	8.1
Fraction of sample firms with total sales > industry median	0.94**	0.98**	1.00**	0.75*
Book-to-market ratio				
Mean	0.38	0.33	0.37	0.52
Median	0.36	0.34	0.36	0.50
Fraction of sample firms with book-to-market > industry median	0.37*	0.37	0.21**	0.56
Fraction of sample firms listed on NASDAQ (v. Nyse/Amex)	0.12	0.11	0.14	0.11
Number of rival firms in each industry portfolio				
Mean	38	35	45	38
Median	20	15	36	27
Herfindahl industry concentration index				
Mean	0.26	0.29	0.18	0.30
Median	0.16	0.21	0.10	0.19
Fraction of sample firms in the industry of				
Manufacturing	0.60	0.67	0.57	0.44
Finance	0.09	0.06	0.09	0.17
Transportation	0.22	0.15	0.29	0.33

Table 3: Environmental performance

CL represents firms that have joined the EPA Climate Leaders program, GHG represents Climate Leaders firms that have pledged a goal for the reduction of greenhouse gases, and Ceres represents firms that have endorsed the Ceres principles, 1993-2006. The criteria for carbon intensity and the emissions of greenhouse gases are from the Carbon Disclosure Project and the firm's sustainability report. The environmental rankings are from KLD Stats in the year prior to the announcement. The climate score is the net of the KLD strength "clean energy" and the concern "climate change". ** (*) indicates that the sample mean is significantly different from the industry mean at the 1% (5%) level, using a Wilcoxon signed ranks test.

	All firms	CL	GHG	Ceres
Fraction of firms in carbon intensive industries	0.63	0.63	0.76	0.50
Emissions of GHG in prior year (million metric tonnes in CO ₂ equivalents)				
Mean	18.4	18.2	25.6	7.9
Median	2.7	2.6	2.9	6.4
Number of cases	59	36	14	9
Number of sample firms with KLD data	66	35	19	12
Number of industry rivals with KLD data				
Mean	16	15	18	16
Median	13	6	20	13
<u>Total environmental score</u>				
mean	-0.26	-0.40	-0.21	0.08*
min	-3	-3	-3	-2
max	3	3	2	2
proportion firms with score > industry mean	0.48	0.44	0.47	0.60
proportion firms with score < industry mean	0.31	0.37	0.35	0.10
<u>Environmental strengths</u>				
mean	0.71**	0.63*	0.95**	0.58*
min-max	0-3	0-4	0-3	0-2
proportion firms with score > industry mean	0.54	0.44	0.65	0.60
proportion firms with score < industry mean	0.22	0.30	0.18	0.10
<u>Environmental concerns</u>				
mean	0.97	1.03	1.16	0.50
Min-max	0-4	0-3	0-4	0-2
proportion firms with score > industry mean	0.37	0.41	0.47	0.10
proportion firms with score < industry mean	0.30	0.37	0.29	0.10
<u>Climate score</u>				
mean	0.06	-0.06	0.16	0.38
min	-1	-1	-1	0
max	1	1	1	1
proportion firms with score > industry mean	0.27	0.18	0.35	0.43
proportion firms with score < industry mean	0.16	0.26	0.06	0.00

Table 4: Announcement abnormal return estimates for the sample firms

CL represents the 58 firms that have joined the EPA Climate Leaders program, GHG represents the 22 Climate Leaders firms that have announced a greenhouse gas reduction goal, and Ceres represents the 22 firms that have endorsed the Ceres Principles, 1993-2006. The abnormal return for firm j is estimated as $AR_{jt} = R_{jt} - (\hat{\alpha}_j + \hat{\beta}_j R_{mt})$, where R_{jt} is the return of the stock of firm j on day t ; R_{mt} is the market return on day t ; and $\hat{\alpha}_j$ and $\hat{\beta}_j$ are the coefficients estimated from the single-factor market model $R_{jt} = \alpha_j + \beta_j R_{mt} + \epsilon_{jt}$ over 250 days, ending on day -6. ** and * indicate significance at the 1% and 5% level, respectively, using a Patell Z test for the abnormal returns and a general sign test for the sign ratio.

	All firms	CL	GHG	Ceres
A: Equal-weighted index				
Average daily AR (in%):				
day -2	-0.06	-0.07	-0.01	0.30
day -1	-0.29*	-0.54**	-0.31	-0.09
day 0	-0.29*	-0.28	-0.47*	0.19
day +1	-0.10*	-0.07	-0.52*	0.63
day +2	-0.43**	-0.50*	-0.26	-0.60*
<u>Window: -1 to +1</u>				
Average cumulative abnormal return ACAR _{-1,1} (in%)	-0.68** (-3.170)	-0.89** (-2.519)	-1.30** (-2.855)	0.73 (0.528)
Ratio of positive to negative CAR _{-1,1}	30:55* (-2.216)	17:29 (-1.416)	3:18** (-3.023)	13:12 (0.550)
<u>Window: -2 to +2</u>				
Average cumulative abnormal return ACAR _{-2,2} (in%)	-1.17** (-3.877)	-1.46** (-3.119)	-1.58** (-2.800)	0.44 (-0.037)
Ratio of positive to negative CAR _{-2,2}	24:61** (-3.519)	14:32* (-2.302)	3:18** (-3.023)	10:15 (-0.653)
B: Value-weighted index				
<u>Window: -1 to +1</u>				
Average cumulative abnormal return ACAR _{-1,1} (in%)	-0.43* (-2.197)	-0.67* (-1.801)	-0.93* (-2.147)	0.78 (0.424)
Ratio of positive to negative CAR	36:49 (-1.342)	19:27 (-1.140)	7:14 (-1.528)	10:8 (0.556)
<u>Window: -2 to +2</u>				
Average cumulative abnormal return ACAR _{-2,2} (in%)	-0.61* (-2.228)	-0.89* (-1.783)	-0.83* (-1.682)	0.35 (-0.174)
Ratio of positive to negative CAR	37:48 (-1.125)	21:25 (-0.550)	8:13 (-1.091)	8:10 (-0.387)

Table 5: Cross-sectional determinants of the announcement returns

Coefficient estimates from WLS regressions of the percent announcement return $CAR_{-1,1}$. The sample comprises 58 firms that have joined the EPA Climate Leaders program (CL), pledged a greenhouse gas goal (GHG), or endorsed the Ceres principles, 1993-2006. Industry controls are included for manufacturing, finance and transportation. p-values are in parenthesis.

	All firms			CL/GHG
Intercept	-1.033 (0.217)	-1.364 (0.100)	-1.756 (0.016)	-2.575 (0.002)
Crude oil price (\$/barrel, 3 month mean)	0.068 (0.004)	0.058 (0.011)	0.061 (0.005)	0.049 (0.042)
Carbon intensive industry	1.529 (0.000)	1.695 (0.000)	1.622 (0.000)	1.969 (0.000)
Climate press hits (in thousands, last year)	-0.130 (0.012)	-0.093 (0.061)	-0.091 (0.061)	-0.071 (0.166)
Announcement for Climate Leader	-1.540 (0.000)	-1.554 (0.000)	-1.444 (0.000)	
Announcement of GHG goal	-1.247 (0.003)	-0.144 (0.783)	-0.129 (0.801)	1.231 (0.013)
GHG reduction goal in %		-0.052 (0.017)	-0.048 (0.022)	-0.043 (0.049)
Market cap (\$ billions)	-0.001 (0.586)	0.000 (0.898)	0.001 (0.706)	0.003 (0.379)
Book-to-market value	1.526 (0.007)	1.656 (0.003)	1.506 (0.004)	1.674 (0.008)
Herfindahl index	-1.385 (0.040)	-1.226 (0.054)	-0.913 (0.101)	-1.344 (0.082)
Environmental strengths	0.004 (0.982)	0.123 (0.441)	0.116 (0.444)	0.079 (0.657)
Environmental concerns	-0.335 (0.036)	-0.422 (0.009)	-0.492 (0.001)	-0.435 (0.007)
Climate score	-0.112 (0.666)	-0.099 (0.685)	-0.236 (0.283)	-0.137 (0.591)
Industry fixed effects	yes	yes	no	yes
Number of cases, N	58	55	55	33
Adjusted R ²	0.361	0.472	0.486	0.451
F-value	3.30 (0.001)	4.22 (0.000)	5.26 (0.000)	3.69 (0.001)

Table 6: Changes in the environmental rankings

The table shows the frequency of firms with changes in the KLD STATS environmental rankings from year -1 through year +1, where 0 is the announcement year. The firm sample comprises 58 firms that have joined the EPA Climate Leaders program, 22 firms that have announced goals for greenhouse gas reduction (as part of the Climate Leaders program), and 22 firms that have joined the Ceres principles, 1993-2006. ** (*) indicates that the sample mean is significantly different from zero at the 1% (5%) level, using a t- test.

	Change in the KLD score					N	Mean
	-2	-1	0	1	2		
<u>Total environmental score</u>							
All firms	1	8	21	13	3	46	0.20
Climate Leaders	1	4	12	5	2	24	0.13
GHG goal	0	3	8	4	1	16	0.19
Ceres	0	1	1	4	0	6	0.50
<u>Environmental strengths</u>							
All firms	0	0	30	15	1	46	0.37**
Climate Leaders	0	0	16	8	0	24	0.33**
GHG goal	0	0	11	4	1	16	0.38*
Ceres	0	0	3	3	0	6	0.50
<u>Environmental concerns</u>							
All firms	0	4	32	8	2	46	0.17
Climate Leaders	0	3	15	4	2	24	0.21
GHG goal	0	0	13	3	0	16	0.19
Ceres	0	1	4	1	0	6	0.00
<u>Climate change</u>							
All firms	0	0	34	9	0	43	0.21**
Climate Leaders	0	0	19	5	0	24	0.21*
GHG goal	0	0	12	4	0	16	0.25*
Ceres	0	0	3	0	0	3	0.00

Table 7: Cross-sectional determinants of the change in environmental rankings

Coefficient estimates for OLS regressions of the change in the KLD environmental rankings from year -1 to +1, where 0 is the event year. The sample comprises 41 firms that have joined the EPA Climate Leaders program, pledged a greenhouse gas reduction goal, or endorsed the Ceres principles, 1993-2006. Industry controls are included for manufacturing, finance and transportation. p-values are in parenthesis.

Dependent variable:	Total score		Strengths	Concerns
Intercept	0.370 (0.652)	0.395 (0.628)	0.153 (0.776)	-0.242 (0.698)
Crude oil price (\$/barrel, 3 month mean)	0.055 (0.042)	0.055 (0.042)	0.026 (0.135)	-0.029 (0.155)
Carbon intensive industry	-0.637 (0.109)	-0.519 (0.200)	-0.013 (0.960)	0.506 (0.106)
Climate press hits (in thousands, last year)	-0.189 (0.031)	-0.194 (0.026)	-0.052 (0.351)	0.143 (0.033)
Announcement for Climate Leader	0.492 (0.167)	0.467 (0.187)	0.251 (0.278)	-0.217 (0.419)
Announcement for Ceres	0.717 (0.151)	0.732 (0.140)	0.287 (0.373)	-0.445 (0.238)
Announcement return CAR _{-1,1} (in%)	0.039 (0.712)	0.030 (0.777)	0.041 (0.551)	0.011 (0.887)
Market cap (\$ billions)	-0.005 (0.090)	-0.005 (0.104)	-0.003 (0.071)	0.001 (0.564)
Book-to-market value	-1.099 (0.022)	-1.002 (0.037)	-0.560 (0.073)	0.442 (0.218)
Herfindahl index	-1.562 (0.028)	-1.608 (0.024)	-0.862 (0.061)	0.746 (0.159)
Total environmental score	-0.342 (0.004)			
Environmental strengths		-0.537 (0.011)	-0.211 (0.114)	0.325 (0.040)
Environmental concerns		0.244 (0.085)	-0.010 (0.914)	-0.254 (0.022)
Industry fixed effects	yes	yes	yes	yes
Number of cases, N	44	44	44	44
Adjusted R ²	0.270	0.280	0.114	0.229
F-value	2.22 (0.035)	2.19 (0.036)	1.39 (0.217)	1.91 (0.068)

Table 8: Rival portfolio announcement abnormal return estimates

CL represents the 58 firms that have joined the EPA Climate Leaders program, GHG represents the 22 Climate Leaders firms that have announced a greenhouse gas reduction goal, and Ceres represents the 22 firms that have endorsed the Ceres Principles, 1993-2006. The abnormal return for firm j is estimated as $AR_{jt} = R_{jt} - (\hat{\alpha}_j + \hat{\beta}_j R_{mt})$, where R_{jt} is the return of the stock of firm j on day t ; R_{mt} is the market return on day t ; and $\hat{\alpha}_j$ and $\hat{\beta}_j$ are the coefficients estimated from the single-factor market model $R_{jt} = \alpha_j + \beta_j R_{mt} + \epsilon_{jt}$ over 250 days, ending on day -6. ** and * indicate significance at the 1% and 5% level, respectively, using a Patell Z test for the abnormal returns and a general sign test for the sign ratio.

	All firms	CL	GHG	Ceres
A: Equal-weighted index				
Average daily AR (in%):				
day -2	0.13	0.29	-0.24	0.13
day -1	-0.02	0.00	-0.21	0.13
day 0	-0.09	-0.01	-0.19	-0.20
day +1	-0.02	-0.12	0.10	0.13
day +2	-0.11	-0.10	-0.01	-0.27*
<u>Window: -1 to +1</u>				
Average cumulative abnormal return ACAR _{-1,1} (in%)	-0.13 (-1.521)	-0.13 (-0.492)	-0.29 (-1.373)	0.06 (1.056)
Ratio of positive to negative CAR _{-1,1}	27:51** (-2.408)	18:25 (-0.892)	4:15** (-2.431)	5:11 (-1.207)
<u>Window: -2 to +2</u>				
Average cumulative abnormal return ACAR _{-2,2} (in%)	-0.12* (1.647)	0.05 (-0.111)	-0.54* (-1.871)	-0.07 (-1.415)
Ratio of positive to negative CAR _{-2,2}	32:46 (-1.275)	22:21 (0.328)	5:14* (-1.972)	5:11 (-1.207)
B: Value-weighted index				
<u>Window: -1 to +1</u>				
Average cumulative abnormal return ACAR _{-1,1} (in%)	0.10 (-0.033)	0.07 (0.643)	0.05 (-0.391)	0.24 (-0.700)
Ratio of positive to negative CAR	34:44 (-1.488)	22:21 (-0.100)	5:14** (-2.355)	7:9 (-0.558)
<u>Window: -2 to +2</u>				
Average cumulative abnormal return ACAR _{-2,2} (in%)	0.41 (0.964)	0.61* (1.992)	0.16 (-0.219)	0.19 (-0.899)
Ratio of positive to negative CAR _{-2,2}	43:35 (-1.488)	30:13** (2.342)	7:12 (-1.435)	6:10 (-1.058)

Table 9: Determinants of rival announcement returns

Coefficient estimates from WLS regressions of the announcement abnormal return $CAR_{-1,1}$ (in %). The sample comprises 51 rival portfolios of firms that have joined the EPA Climate Leaders program (CL), pledged a greenhouse gas reduction goal (GHG), or endorsed the Ceres Principles, 1993-2006. Industry controls are included for manufacturing, finance and transportation. p-values are in parenthesis.

	All firms		CL/GHG	
Intercept	1.488 (0.197)	1.456 (0.132)	0.489 (0.635)	0.543 (0.548)
Crude oil price (\$/barrel)	0.010 (0.776)	0.002 (0.962)	0.014 (0.734)	0.005 (0.899)
Carbon intensive industry	-0.318 (0.587)	-0.123 (0.812)	-0.413 (0.507)	-0.139 (0.795)
Climate press hits (in thousands)	-0.059 (0.473)	-0.036 (0.654)	-0.074 (0.431)	-0.028 (0.750)
Announcement for Climate Leader	-1.079 (0.034)	-0.816 (0.083)		
Announcement of GHG goal	-1.220 (0.033)	-1.066 (0.056)	-0.093 (0.829)	-0.197 (0.641)
Herfindahl index	-3.933 (0.012)	-3.205 (0.021)	-3.013 (0.090)	-1.796 (0.248)
Rival mean environmental strengths	2.830 (0.033)	2.560 (0.049)	3.061 (0.029)	2.711 (0.050)
Rival mean environmental concerns	-0.755 (0.158)	-0.985 (0.059)	-0.805 (0.145)	-0.998 (0.065)
Rival mean climate score	-1.739 (0.160)	-1.377 (0.249)	-2.066 (0.121)	-1.582 (0.223)
Sample firm environmental strengths	0.950 (0.002)	0.972 (0.001)	0.881 (0.008)	0.823 (0.012)
Sample firm environmental concerns	-0.066 (0.789)	-0.137 (0.561)	0.023 (0.929)	-0.077 (0.752)
Sample firm climate score	-1.010 (0.020)	-1.226 (0.004)	-0.630 (0.186)	-0.927 (0.044)
Industry fixed effects	yes	no	yes	no
Number of cases, N	51	51	44	44
Adjusted R ²	0.213	0.199	0.141	0.112
F-value	1.90 (0.058)	2.03 (0.048)	1.50 (0.171)	1.49 (0.182)

Table 10: The 30 sample firms with the most negative announcement return

List of 30 sample firms joining the EPA Climate Leaders program or endorsing the CERES principles with the most negative announcement returns. The year is the announcement year. The cumulative abnormal return CAR is measured over days -1 through +1, using an equal-weighted index.

Company name	Initiative	Year	Announcement CAR in %
Target Corp.	Climate Leaders	2002	-4.2
Pfizer Inc.	Climate Leaders	2002	-3.8
Baxter International Inc.	Climate Leaders	2002	-3.5
Lucent Technologies Inc.	Climate Leaders	2006	-3.1
Hasbro Inc.	Climate Leaders	2002	-3.0
Northeast Utilities	Ceres	1999	-2.2
Cinergy Corp.	Climate Leaders	2002	-2.2
Lockheed Martin Corp.	Climate Leaders	2002	-2.0
Whole Foods Market	Climate Leaders	2006	-1.9
Unilever HPC	Climate Leaders	2003	-1.6
Tyson Foods Inc.	Climate Leaders	2004	-1.5
NiSource Inc.	Climate Leaders	2004	-1.4
Caterpillar Inc.	Climate Leaders	2003	-1.2
Public Service Enterprise Group	Climate Leaders	2002	-1.0
Coors Brewing Co.	Climate Leaders	2006	-1.0
Sunoco, Inc.	Ceres	1993	-0.9
FPL Group Inc.	Climate Leaders	2002	-0.9
Cummins Inc.	Climate Leaders	2006	-0.9
Citigroup Inc.	Climate Leaders	2006	-0.8
Johnson & Johnson	Climate Leaders	2002	-0.8
Oracle Corp	Climate Leaders	2004	-0.8
Steelcase Inc.	Climate Leaders	2006	-0.7
Raytheon Co.	Climate Leaders	2003	-0.7
Travelers Companies	Climate Leaders	2006	-0.7
Johnson Controls Inc.	Climate Leaders	2004	-0.6
HSBC - North America	Climate Leaders	2006	-0.6
International Paper	Climate Leaders	2002	-0.6
DuPont Co	Climate Leaders	2006	-0.6
ITT Corporations	Ceres	1997	-0.6
British Petroleum	Climate Leaders	2002	-0.5

Table 11: Determinants of the decision to join Climate Leaders and Ceres

Coefficient estimates from logit regressions for the probability that a firm joins EPA Climate Leaders (CL) or Ceres. The sample is 79 firms in CL or Ceres and 762 of their industry rival firms. Industry controls are manufacturing, finance and transportation. p-values are in parenthesis.

	CL or Ceres		CL	Ceres
Intercept	-0.319 (0.655)	-1.065 (0.067)	-1.123 (0.068)	-4.214 (0.040)
Crude oil price (\$/barrel, 3 month mean)	-0.051 (0.002)	-0.065 (0.000)	-0.073 (0.000)	-0.050 (0.306)
Carbon intensive industry	-1.372 (0.002)	-1.273 (0.001)	-1.087 (0.010)	-8.147 (0.005)
Climate press hits (in thousands, last year)	0.099 (0.000)	0.110 (0.000)	0.115 (0.000)	0.178 (0.002)
Market cap (\$ billions)	0.000 (0.709)	0.000 (0.717)	0.000 (0.507)	0.000 (0.009)
Book-to-market value	0.000 (0.885)	0.000 (0.877)	0.000 (0.878)	0.000 (0.999)
NASDAQ	-1.665 (0.001)	-0.975 (0.032)	-0.879 (0.078)	-2.265 (0.095)
Corporate governance strengths	0.127 (0.719)	0.201 (0.554)	0.172 (0.633)	1.133 (0.274)
Corporate governance concerns	0.554 (0.022)	0.723 (0.002)	0.716 (0.004)	1.563 (0.012)
Environmental strengths	1.251 (0.000)	1.405 (0.000)	1.474 (0.000)	0.286 (0.733)
Environmental concerns	0.067 (0.669)	-0.055 (0.708)	-0.103 (0.495)	0.202 (0.749)
Climate score	-0.051 (0.887)	-0.285 (0.392)	-0.544 (0.118)	7.633 (0.005)
Industry fixed effects	yes	no	no	no
Number of firms in CL or Ceres (y=1)	79	79	68	11
Number of rival firms (y=0)	762	762	762	762
Cox & Snell R ²	0.161	0.140	0.123	0.071
Chi-square	148.0 (0.000)	126.8 (0.000)	109.2 (0.000)	57.1 (0.000)

Table 12: Cross-sectional regressions with Heckman correction for self-selection

Coefficient estimates from WLS estimations of the percent announcement return $CAR_{-1,1}$, the change in environmental rankings, and the rival portfolio announcement $CAR_{-1,1}$. The sample is 55 firms that join Climate Leaders, set a GHG goal, or join Ceres, 1993-2006. The dependent variables are the announcement $CAR_{-1,1}$, the change in environmental rankings (year -1 to +1), and the rival portfolio announcement $CAR_{-1,1}$. p-values are in parenthesis.

Dependent variable:	$CAR_{-1,1}$	$\Delta env. score$	Rival $CAR_{-1,1}$
Intercept	-1.094 (0.313)	0.627 (0.516)	0.481 (0.759)
Crude oil price (\$/barrel, 3 month mean)	-0.013 (0.725)	0.060 (0.107)	0.058 (0.263)
Carbon intensive industry	1.251 (0.027)	-0.712 (0.133)	-0.508 (0.341)
Climate press hits (in thousands, last year)	0.060 (0.494)	-0.188 (0.046)	-0.165 (0.216)
Announcement abnormal stock return $CAR_{-1,1}$		0.122 (0.301)	
Announcement for Climate Leader	-1.930 (0.001)	0.515 (0.217)	0.071 (0.940)
Announcement of GHG goal	-0.648 (0.437)		-0.374 (0.690)
GHG reduction goal in %	-0.046 (0.142)		
Market cap (\$ billions)	0.001 (0.682)	-0.005 (0.094)	
Book-to-market value	1.118 (0.063)	-1.145 (0.032)	
Herfindahl index	0.349 (0.696)	-1.649 (0.038)	-2.143 (0.076)
Environmental strengths	0.630 (0.079)	-0.624 (0.069)	-0.435 (0.269)
Environmental concerns	-0.217 (0.332)	0.239 (0.120)	0.091 (0.616)
Climate score	-0.196 (0.600)		-0.012 (0.973)
Rival average environmental strengths			-1.153 (0.189)
Rival average environmental concerns			0.092 (0.795)
Rival average environmental climate score			1.502 (0.201)
Mills ratio, $\lambda=\phi/\Phi$	-1.349 (0.039)	0.363 (0.549)	0.023 (0.974)
Industry fixed effects	yes	yes	yes
Number of cases, N	55	41	35
Adjusted R^2	0.319	0.215	0.109
F-value	2.58 (0.008)	1.78 (0.098)	1.26 (0.316)